(2) In the volume on "sub-alpine" plants, the author gives short descriptions and the distribution of about 850 species of flowering plants which occur in the woods and meadows of the Swiss valleys. Both the descriptions and the notes concerning the habitats of the plants are good. There are 168 illustrations on thirty-three coloured plates. Some of these drawings are good, but many of them are rather too small to be of much aid in identification. The introductory part of the book consists of six chapters containing much information with regard to the habitats, the collection, and the preservation of alpine plants. There are also some very useful hints on the cultivation of alpines, an interesting account of some of the alpine gardens recently established in Switzerland, and a comparison of the Swiss and British floras. The book will be found very useful to all those visitors to the Alps who are interested in field botany.

(3) Mr. Boulger's small volume on botany, which forms one of the twentieth-century science series, is an elementary primer which the young student will find helpful in many ways. The chapters on the "Beginnings of Botany" and "Botanists' Methods" are sure to hold his attention, and others of the twelve chapters into which the book is divided will also prove stimulating. It is a pity that in the chapter on "Primitive Plants" the green type selected should have been "Protococcus," particularly as the author writes under that name a combined account of Pleurococcus and the volvocine genus Sphærella, a mistake which is largely due to the extraordinary statements regarding Protococcus which are found in nearly all botanical text-books. The author should also be reminded that Engler's arrangement is by no means the latest classification for all groups of plants.

(4) The text-book of general botany by Dr. Nathansohn will be very useful to the student who wishes to go just beyond the more elementary parts of the subject. It is divided into two main sections, the first dealing with the vegetative life of plants, and the second with reproduction. The general treatment is good, and one of the best features of the book is the way in which the physiological aspect of the subject is kept constantly before the reader. There are numerous illustrations, for the most part very good, but one would like to have seen more original figures. One or two of the photographic plates are excellent. A number of errors in the spelling of plant-names occur, but on the whole the book is well written, and will meet with the approval of most students.

SCHOOL MATHEMATICS.

(1) *Macmillan's Reform Arithmetic.* By P. Wilkinson and F. W. Cook. Book i., pp. 48; 3*d.* Book ii., pp. 48; 3*d.* Book iii., pp. 48; 3*d.* Book iv., pp. 48; 3*d.* Book v., pp. 64; 4*d.* Book vi., pp. 64; 4*d.* Teacher's Books i.–iv., 9*d.* each; Book v., 1*s.* (London: Macmillan and Co., Ltd., 1911.)

(2) *Analytical Mechanics.* Comprising the Kinetics and Statics of Solids and Fluids. By Prof. E. H. Barton. Pp. xx+535. (London: Longmans, Green and Co., 1911.) Price 10*s.* 6*d.* net.

(3) *Elementary Trigonometry.* By F. T. Swanwick. Pp. xv+243. (Cambridge: University Press, 1911.) Price 4*s.*

(4) *Geometry for Schools.* By W. G. Borchardt and the Rev. A. D. Perrott. Vol. i.: Stages I. and II. Pp. viii+52+iii. Price 1*s.* Vol. ii.: Stage III. (Section i.). Pp. viii+53–162+iv. Price 1*s.* 6*d.* (London: G. Bell and Sons, Ltd., 1911.)

(5) *The Elements of Plane and Spherical Trigonometry.* By J. G. Hun and C. R. MacInnes. Pp. vii+205. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1911.) Price 6*s.* net.

(6) *An Elementary Treatise on Cross-ratio Geometry.* With historical notes. By the Rev. J. J. Milne. Pp. xxiii+288. (Cambridge: University Press, 1911.) Price 6*s.*

(7) *Junior Mathematics.* Being a Course of Geometry and Algebra for Beginners. By D. B. Mair. Pp. viii+200. (Oxford: The Clarendon Press, 1911.) 2*s.*

(8) *Plane Trigonometry.* (Strictly according to the Syllabus prescribed by the Indian Universities.) By Prof. L. K. Ghosh. Pp. viii+271. (Calcutta: G. N. Halder, 1911.) Rs.1/8.

(9) *Poliedri, Curve e Superficie secondo i metodi della Geometria Descrittiva.* By Prof. Gino Loria. Pp. xv+235. Milano: Ulrico Hoepli, 1912.) Price 3 lire.

(10) *Elementary Graphic Statics.* By Dr. W. J. Crawford. Pp. viii+131. (London: Charles Griffin and Co., Ltd., 1911.) Price 2*s.* 6*d.* net.

(11) *A Treatise on Hydromechanics.* By Dr. W. H. Besant, F.R.S., and A. S. Ramsey. Part i., Hydrostatics. Seventh edition. Pp. vi+275. (London: G. Bell and Sons, Ltd., 1911.) Price 7*s.* 6*d.* net.

(1) THE authors of this work include, and in our opinion rightly, under the heading of arithmetic, the elements of algebra and practical geometry. The course is arranged in six parts, each of which contains material for three terms'

work. There is very little explanatory text in the pupil's edition, which consists of a series of carefully graduated sets of examples; but the volume designed for the teacher contains not only the answers and additional oral exercises, but also illustrations of the methods recommended for use and a large number of useful hints and cautions, the full value of which will be realised only by those who are acquainted with the varied difficulties of the beginner. The teaching of elementary arithmetic is a harder task than many people admit, and requires more skill and care than is often recognised. Success can be achieved only by a careful formulation of the scheme of work and of the methods to be employed. In this, the teacher's edition should be most useful. It is thoroughly sound and trustworthy, and full of excellent suggestions.

(2) The contents of this volume are best explained by enumerating the headings of the six parts into which it is divided. These are (1) Introduction; (2) Kinematics; (3) Kinetics; (4) Statics; (5) Hydromechanics; (6) Elasticity. It is assumed that the reader possesses an elementary knowledge of the methods of the calculus, and is not entirely unacquainted with the ideas of mechanics; the more elementary parts of the subject are therefore treated in outline, and are intended mainly for revision or reference.

The section on kinematics opens with a discussion of the properties of vector quantities. This is followed by chapters on rectilinear motion, which includes the case of variable acceleration, motion in a curve subject to a central acceleration, analysis of plane rotations, motion in space with fixed and moving axes, consideration of different forms of linkages, and a brief but lucid account of the theory of strains. The treatment of kinetics is prefaced by a valuable and most interesting account, mainly historical, of the physical conceptions upon which the theory is based. The discussion of the motion of rigid bodies in this section and of the theory of attraction and general conditions of equilibrium in the next follows the customary lines. Only forty pages are devoted to hydrostatics and hydrokinetics, and about twenty pages to elasticity. There is an admirable collection of miscellaneous examples at the end of the book.

(3) This book is intended for use with beginners; but either the author is not in sympathy with the recent changes in connection with the teaching of elementary trigonometry, or else he is writing for students who take up the subject at a late stage in their course. Now that it has become the custom for boys in the middle divisions of public schools to start trigonometry at a time when formerly they would have still been occupied with complicated arithmetical problems and algebraic manipulation, it is both necessary and instructive to lay great emphasis on the numerical aspect. Identity work and applications to the geometry of the triangle are unsuited to the purpose which this change in the curriculum serves. The present volume opens with a chapter on contracted arithmetic; the second chapter defines the trigonometric ratios, and gives rather more than thirty identities as examples on the fundamental formulæ; this is followed by the ratios of special angles and the solution of equations; numerical applications to the right-angled triangle are consequently postponed to the fourth chapter, and even here the examples are far from adequate. Part i. closes with chapters on logarithms and the solution of oblique triangles. The subjects dealt with in the second part are circular measure, ratios of obtuse angles, addition formulæ, and applications to the triangle. The concluding part deals with the general angle, methods of proof by projection, and properties of the triangle and quadrilateral. The author has the gift of writing simply and clearly, and the printing is well up to the high standard of the Cambridge University Press.

(4) The authors have followed the suggestions made in the Board of Education's circular on the teaching of geometry. The fundamental concepts and theorems of geometry are illustrated by experimental methods, and a varied collection of numerical exercises is supplied. Formal proofs are reserved for the second volume, which contains the substance of Euclid I. 1–34. In our opinion, the value of this method of exposition is seriously affected if riders of a simple character are excluded from the preliminary stage. If the student is restricted to numerical work, he will be slow to appreciate and assimilate the elementary properties of geometry. The disadvantage of opening with a formal course lies in the inherent difficulties of the proofs of the early theorems. But if the results of these are assumed, a very numerous set of applications can be made.

(5) This volume contains in rather less than a hundred pages a brief account of the elements of plane and spherical trigonometry. It is written for the student who requires only a practical knowledge of the methods of the subject. No attempt is made to give analytical dexterity, and all discussion of geometrical applications is omitted. But great care is taken to impress on the reader the supreme importance of methodical arrangement of numerical work. Tables of logarithms and the trigonometric functions occupy the second half of the book. It is both curious and regrettable that spherical trigonometry is included in

very few school courses. The educational value of solid geometry is gradually becoming recognised, and it is not improbable that this change of attitude may affect the teaching of trigonometry.

(6) This is a book which should prove of deep interest to all students of geometry. The author has been able, by confining himself to the methods of cross-ratio, to attain a thoroughness of treatment which has been impossible for previous writers, who have combined the theory of cross-ratio with other methods of projective geometry. There is much in this volume that is original, and numerous references are given to other works. One of the most valuable features is the insertion of copious historical notes. The author has made a special study of ancient geometry, and all who are interested in the development of the subject will value highly the results of his researches.

The book falls into two parts: the first deals with pencils and ranges of the first order, and contains a comprehensive account of the theory of homography and involution, special attention being directed to the practicability of constructions; the second gives a selection of the applications to the conic, in particular the theory of ranges of the second order and conics having double contact. There are, in addition, two appendices, one of which gives Pappus's account of the Porisms of Euclid, and the other a proof of Pascal's theorem by the methods of Euclid and Apollonius.

The treatment goes considerably beyond the requirements of the ordinary scholarship candidate, so that pressure of work will probably not admit of its being read at school. But we hope that it will find a place in the course of reading at the university, for it is essentially a scholarly treatise.

(7) This volume contains an introductory treatment of algebra and geometry, the latter predominating. The chief feature of the book is the admirable nature of the examples. There is a greater variety of form and freshness of character than we have seen in any other text-book of this kind. The intrinsic difficulties are few, the pupil being required to show common sense and self-reliance rather than technical skill. Probably the better plan would be to use it in conjunction with other text-books rather than by itself. We hope it will become widely known.

(8) This is a text-book of the old-fashioned type. There is little numerical work, the general angle is introduced at an early stage, the formulæ for sums and products and for multiple angles precede the solution of triangles, and there is no simple work on heights and distances. The quality of the paper used is distinctly poor

(9) This volume presents in a fairly compact form a course of solid geometry, mainly practical and descriptive; but some analytical work is also included. No claim is made to any originality in treatment. The book is divided into three parts: the first contains a discussion of the solid angle formed by three planes, the representation in plan and elevation of the regular solids in simple positions and problems on sections; the second deals with plane and tortuous curves with special reference to the helix; and the last with surfaces of revolution, cylinders, and ruled surfaces, the method of index notation being fully explained. Owing to the small size of the page, some of the figures are printed across the binding, but in other respects they are very clear. There are no exercises.

(10) We cannot praise too highly this small volume; it is both simple and comprehensive. The subject of graphical statics is of real educational value. To regard it as suitable only for engineering students is an error which is now generally recognised. The mathematical specialist and the boy who is devoting time to the subject for the sake of a general education will alike profit by a course of this character. But neither of them needs that developed technique which the engineer or architect must acquire. One hour a week for a single term for the specialist, and about twice as much for the amateur, is sufficient to cover the range of this book. The boy who needs it for professional purposes will, however, have to devote three or four terms to it. The text is clearly put and illustrated by a number of excellent diagrams. There is a first-rate collection of examples.

(11) Dr. Besant's treatise on Hydrostatics, which was published about forty years ago, is so well known that any comment upon it is superfluous. It has now reached its seventh edition; but the alterations and additions that have been made are comparatively few. In appearance it is now rather more attractive, owing to the use of a larger page and wider spacing. Among the additions may be noted a treatment of stability of equilibrium by the principle of energy, which occupies nine pages, the use of Weierstrass's notation in some of the capillarity results which involve elliptic integrals, and a more comprehensive account of the equilibrium of revolving liquids. The collection of examples has also been improved by the introduction of a large number of problems taken from recent university examination papers.